

CLAIMS

1. A deformable mirror comprising: a passive substrate layer having a
5 reflective surface provided thereon; a first layer of actively deformable material,
attached to the passive substrate layer, that is operable to deform the mirror as
a result of transverse expansion or contraction of the material under the
influence of a field applied across its thickness; and an actuator coupled to one
of said layers that is operable to further deform the mirror.
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2. A deformable mirror according to claim 1, wherein the first layer of
actively deformable material is bonded to the passive substrate layer.
3. A deformable mirror according to claim 1, comprising a second layer of
15 actively deformable material bonded to the first layer of actively deformable
material.
4. A deformable mirror according to any one of claims 1, 2 or 3, comprising
a plurality of actuators, each coupled to one of said layers.
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5. A deformable mirror according to claim 4, wherein the actuators are
arranged to be operable to correct lower order Zernike modes.
6. A deformable mirror according to any one of the preceding claims,
25 wherein the first and/or second layer or layers of actively deformable material
is/are segmented and the segments are arranged to be operable to correct
higher order Zernike modes.

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7. A deformable mirror according to any one of the preceding claims, wherein the first and/or second layer or layers of actively deformable material comprise piezoelectric material and the field is an electric field.
- 5 8. A deformable mirror according to any one of the preceding claims, wherein said actuator or actuators are coupled directly to the passive substrate layer by means of one or more apertures in the first and/or second layer or layers of actively deformable material.
- 10 9. A deformable mirror according to any one of the preceding claims, wherein the actuator or actuators comprise magnetostrictive or electrostrictive material.
10. A deformable mirror and deformable-mirror holder, comprising a
15 deformable mirror according to any one of the preceding claims and wherein the holder comprises a body with a central aperture for receiving the deformable mirror, the central aperture being defined by a plurality of flexible beams, with each flexible beam having an end shaped to provide a supporting surface and a flexible portion that connects the beam's end to the holder's body.
- 20 11. A deformable mirror and deformable-mirror holder according to claim 10, wherein the ends of the flexible beams are co-joined to form a unitary structure shaped to provide a supporting surface.
- 25 12. A deformable mirror and deformable-mirror holder according to claim 10 or claim 11, wherein the ends of the beams lie in the plane of the body of the holder such that, in use, the mirror is received within the body of the holder.

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13. A deformable mirror and deformable-mirror holder according to any one of claims 10 to 12, wherein at least one beam is generally L-shaped such that one leg of the L-shape provides the flexible portion and the other leg of the L-shape provides the supporting surface of the end of the beam.

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14. A deformable mirror and deformable-mirror holder according to claim 13, wherein the internal corner of the L-shaped beam has a shoulder that extends part of the way along both legs of the L-shape.

10 15. A deformable mirror and deformable-mirror holder according to any one of claims 10 to 14, wherein the plurality of flexible beams are arranged around the entire aperture.

15 16. A deformable mirror and deformable-mirror holder according to claim 15, wherein the width of the beams is larger than the separation between beams.

17. A deformable mirror and deformable-mirror holder according to claim 16, wherein the width of the beams is greater than four times the separation between beams.

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18. A deformable mirror and a deformable-mirror holder according to claim 13, wherein the peripheral edge of the mirror is supported from below by one leg of the L-shaped beam and is supported from the side by the other leg of the L-shaped beam.

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19. A deformable mirror and a deformable-mirror holder according to claim 14, wherein the peripheral edge of the mirror is supported from below by one leg of the L-shaped beam and is supported from the side by an inwardly-facing side of the shoulder.

20. A method of correcting phase variations in a beam of electromagnetic radiation incident upon a deformable mirror according to any one of claims 1 to 9, wherein the actuator or actuators are moved to correct Zernike modes at or below a threshold order and the first and/or second layer or layers of actively deformable material is/are moved to correct Zernike modes above the threshold order.

21. A method according to claim 20, wherein the actuator or actuators are moved to correct the first and second order Zernike modes and the deformable element is moved to correct third and higher order Zernike modes.